Amendments to the Claims

1. A method, comprising the steps of:

providing an object; and

laser shock peening said object to form at least one set of at least two simultaneously formed, non-overlapping adjacent laser shock peened surfaces.

2. The method as recited in Claim 1, wherein the laser shock peening step further comprises the steps of:

forming a selective laser beam spot pattern on said object sufficient to enable the formation of an overlapping region having compressive residual stress imparted by laser shock peening, said region extending into said object from a said respective laser shock peened surface.

3. The method as recited in Claim 1, wherein the laser shock peening step further comprises the steps of:

forming a selective laser beam spot pattern on said object sufficient to enable at least two respective shockwaves induced by laser shock peening in connection with the simultaneous formation of at least two respective non-overlapping adjacent laser shock peened surfaces to encounter one another within said object.

4. The method as recited in Claim 1, wherein the laser shock peening step further comprises the steps of:

forming a selective laser beam spot pattern on said object, the spot pattern being configured to effectuate the formation of at least one row of spaced-apart shockwave intersection sites in said object, each shockwave intersection site being defined by an encounter between shockwaves induced by laser shock peening, traveling from neighboring spaced-apart laser beam spots.

5. The method as recited in Claim 4, wherein each row of the spot pattern comprises an alternating sequence of shockwave intersection sites and spot overlap sites, each spot overlap site being defined by an overlap between neighboring laser beam spots.

6. The method as recited in Claim 1, wherein the laser shock peening step further comprises the steps of:

forming a selective laser beam spot pattern on said object including at least one row of laser beam spots arranged in spaced-apart overlapping pairs, the spatial relationship between adjacent pairs being sufficient to enable the formation of a shockwave intersection site disposed at least in part therebetween, each shockwave intersection site being defined by an encounter between shockwaves induced by laser shock peening

traveling from nearest neighbor laser beam spots of adjacent laser beam spot pairs.

7. The method as recited in Claim 1, wherein the laser shock peening step further comprises the steps of:

forming a selective laser beam spot pattern on said object including at least one row of non-overlapping laser beam spots configured to define a selective pattern of shockwave intersection sites, each shockwave intersection site being defined by an encounter between shockwaves induced by laser shock peening traveling from neighboring laser beam spots.

8. The method as recited in Claim 1, wherein the laser shock peening step further comprises the steps of:

forming a selective laser beam spot pattern on said object including at least one row of overlapping laser beam spots, the spot pattern being configured to effectuate the formation of at least one row of shockwave intersection sites in said object, each row of shockwave intersection sites being generally disposed between respective adjacent ones of the laser beam spot rows, each shockwave intersection site being defined by an encounter between shockwaves induced by laser shock peening traveling from laser beam spots of adjacent non-overlapping rows.

9. The method as recited in Claim 1, wherein the laser shock peening step further comprises the steps of:

sequentially forming at least one selective laser beam spot pattern on said object, each pattern being configured to effectuate the formation of at least one row of shockwave intersection sites in said object, each shockwave intersection site being defined by an encounter between shockwaves induced by laser shock peening traveling from neighboring laser beam spots.

10. The method as recited in Claim 9, wherein each row of shockwave intersection sites associated with a respective laser beam spot pattern being associated with a respective orientation characteristic defining a directional orientation of the shockwave intersection sites associated therewith.

11. The method as recited in Claim 1, wherein said object includes an airfoil.

12. The method as recited in Claim 1, wherein said object includes a gas turbine engine component.

13. A method, comprising the steps of:

providing an object; and

laser shock peening said object to form at least one set of at least two non-overlapping adjacent laser shock peened surfaces simultaneously formed with one another, each laser shock peened

surface being associated with a respective shockwave induced by laser shock peening;

wherein the respective shockwaves associated with at least one selective set of at least two simultaneously formed, non-overlapping adjacent laser shock peened surfaces encounter one another within said object.

14. A method, comprising the steps of:

providing an object; and

simultaneously laser shock peening said object at a plurality of locations to form at least one pair of adjacent, spaced-apart laser shock peened surfaces on said object and to induce the generation of a respective shockwave in association with the formation of each laser shock peened surface,

wherein the respective spaced-apart relationship between the respective laser shock peened surfaces of at least one respective laser shock peened surface pair being sufficient to enable the respective shockwaves associated therewith to encounter one another within said object.

15. A method, comprising the steps of:

providing an object;

laser shock peening said object to form at least one set of at least two simultaneously formed, adjacent laser shock peened surfaces, each laser shock peened surface being associated with a region of compressive residual stresses extending into said object therefrom and imparted by laser shock peening; and

configuring the laser shock peening operation to enable the formation of at least one region overlap location, each region overlap location being formed by the encounter between the shockwaves associated with at least two corresponding simultaneously formed, non-overlapping adjacent laser shock peened surfaces.

16. The method as recited in Claim 15, wherein the configuration step further includes the steps of:

selecting a predetermined non-overlapping relationship for use in forming neighboring ones of the laser shock peened surfaces.

17. A method for use with an object, comprising the steps of:

providing a laser shock processor; and

operating said laser shock processor to laser shock process said object in a manner sufficient to cause at least one set of at least two shockwaves having mutually non-interfering initial wavefronts to develop simultaneously at a selective side of said object and subsequently interact with one another within said object.

18. The method as recited in Claim 17, wherein the step of operating said laser shock processor, in respect of the simultaneous development of each respective set of at least two shockwaves having mutually non-interfering initial wavefronts, comprises the steps of:

simultaneously forming two non-overlapping laser shock processed surfaces on said object.

19. The method as recited in Claim 18, wherein at least two simultaneously formed laser shock processed surfaces having a spatial separation of less than about 5 mm.

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51. A method, comprising the steps of:

providing an object having a first side and a second side disposed generally opposite one another; and

simultaneously laser shock peening said object at the first and second sides thereof to form first and second laser shock peened surfaces at the first and second sides of said object, respectively, wherein the first and second laser shock peened surfaces having a lateral displacement therebetween.

52. A method for use with an object having a first side and a second side generally opposing one another, said method comprising the steps of:

providing a laser shock processing apparatus; and

operating said laser shock processing apparatus to laser shock process said object in a manner sufficient to produce at least one zone of compressive residual stress in said object being characterized by an asymmetrical stress distribution profile relative to a reference plane.

53. The method as recited in Claim 52, wherein the step of operating said laser shock processing apparatus further comprises the steps of:

laser shock peening said object at the first and second sides thereof at different times to form opposing first and second laser shock peened surfaces disposed at the first and second sides of said object, respectively.

54. The method as recited in Claim 52, wherein the step of operating said laser shock processing apparatus further comprises the steps of:

simultaneously laser shock peening said object at the first and second sides thereof using laser beams having different pulse lengths to form opposing first and second laser shock peened surfaces disposed at the first and second sides of said object, respectively.

55. The method as recited in Claim 52, wherein the step of operating said laser shock processing apparatus further comprises the steps of:

simultaneously laser shock peening said object at the first and second sides thereof to form laterally offset first and second laser shock peened surfaces disposed at the first and second sides of said object, respectively.

56. A method, comprising the steps of:

providing an object having a first side and a second side generally opposing one another; and

causing the formation in said object of at least one asymmetrical compressive residual stress distribution profile imparted by suitable laser shock processing of said object, each asymmetrical compressive residual stress distribution profile appearing generally along a respective thickness dimension of said object.

57. The method as recited in Claim 56, wherein the causation step further comprises the steps of:

laser shock peening said object at the first and second sides thereof at different times to form opposing first and second laser shock peened surfaces disposed at the first and second sides of said object, respectively.

58. The method as recited in Claim 56, wherein the causation step further comprises the steps of:

simultaneously laser shock peening said object at the first and second sides thereof using laser beams having different pulse lengths to form opposing first and second laser shock peened surfaces disposed at the first and second sides of said object, respectively.

59. The method as recited in Claim 56, wherein the causation step further comprises the steps of:

simultaneously laser shock peening said object at the first and second sides thereof to form laterally offset first and second laser shock peened surfaces disposed at the first and second sides of said object, respectively.

60. A method, comprising the steps of:

providing an object; and

laser shock peening said object to form at least one set of at least two formed non-overlapping adjacent laser shock peened surfaces having a spacing distance equal to or less than 5 mm from each other and having a maximum time between forming of equal to or less than the spacing distance divided by shockwave velocity in the object.

61. A method, comprising the steps of:

providing an object; and

laser shock peening said object to form at least one set of at least two formed laser shock peened surfaces each having a center, the spacing distance between said centers a distance equal to or less than 5 mm from each other and having a maximum time between forming of equal to or less than the spacing distance divided by shockwave velocity in the object.